



PUBLIC HEALTH REPORT

A discussion of labels as a vector for food information

May 2016

Preface

This report represents the culmination of our Public Health project undertaken at the University of Otago, Wellington as part of the Bachelor of Medicine and Bachelor of Surgery (MBChB) degree. We have also prepared this report for delivery to our client, the Ministry of Primary Industries (New Zealand).

At the outset of this project, our intent was to investigate food labelling in its broadest sense, and use *Campylobacter* infection as a specific case study of an area where improvements in food labelling could have public health value. This intent remains true, however we have chosen to publish our findings in two separate reports to aid readability. This report investigates the wider context of food labelling, while the other report, "*Consumer attitudes towards food labelling: Is chicken literacy a solution for campylobacteriosis?*" (1) examines labelling in the context of *Campylobacter* infection. Both reports share some aspects of methodology and have been prepared in parallel. While they may be read independently, we suggest maximum benefit may be gained from reviewing both.

Wellington, May 2016

Executive summary

Background

Food labels serve an important role in providing information to consumers in an environment where food choices are increasingly complex and direct contact with food producers is declining. Labels provide a direct link between producer and consumer and are a convenient source of information about food products at the point of sale. A wide variety of information is disseminated by labels including nutritional information, safety advice and environmental and ethical considerations. However this information must be both read and understood by consumers for information transfer to take place. Consumer use and understanding of nutrition information panels on food labels has been well described, but consumer desire for other aspects of food content and processing is not as fully explored.

In view of this context, the **aims** of this study were fivefold:

1. Describe current labelling standards in New Zealand and compare these with international standards;
2. Discuss opinions of consumers and key informants regarding information contained on food labels;
3. Describe patterns of label use and understanding by consumer demographic groups, and barriers preventing use or understanding;
4. Explore the effectiveness of labels in encouraging behaviour change; and
5. Provide recommendations for improving food labelling and discuss alternative or complementary methods to enhance communication with consumers.

Methods

To advance our study aims we used three key methods:

Literature review

We carried out a literature review to assess current food labelling regulations and evidence regarding consumer demand for food information and the effectiveness of labels as a communication method.

Survey of shoppers

We conducted a street-intercept survey of supermarket and butchery shoppers in the Wellington region of New Zealand, to assess consumer opinions about food labelling.

Key informant interviews

We interviewed representatives from the fields of food regulation, health promotion and consumer affairs in order to assess views on food labelling and food regulation. Interviews were transcribed and thematically analysed.

Results

Literature review

Mandatory food labelling in New Zealand is comparable with most overseas standards and is predominantly overseen by Food Standards Australia New Zealand and regulated by the Ministry for Primary Industries. However voluntary labelling is overseen by numerous organisations with varying degrees of standardisation of label components.

Information about nutrition and safety is prioritised by consumers, but increasingly consumers are demanding additional information about country of origin, environmental impact, animal welfare and other ethical concerns. Food labels can have strong influences on consumer choices, although they are not universally used by consumers, with higher-educated, wealthier consumers more likely to read and understand food labels. Barriers to label use include confusion due to information overload, lack of trust in labels, time constraints, and lack of interest or understanding. Food labelling can also positively impact food industry behaviour.

Survey of shoppers

We interviewed 401 shoppers during a seven day period (19-25th April 2016). Responses indicated that consumers believe a wide range of information is necessary on a food label, with information about safety for vulnerable groups, food safety information to protect from infectious disease and nutritional information rated essential by the majority of respondents. Moreover, consumers felt that they should be given all information about food items, so that they could make informed purchasing decisions. However, while most consumers reported using a label when first purchasing a food product, a minority agreed that current labels meet their expectations for information content. Lastly, a majority agreed that the government should tax or prohibit certain types of foods, however opinions on these strategies were mixed.

Key informant interviews

Several main themes pertaining to food labelling were identified from expert interviews:

- A subset of consumers use food labels thoroughly, but for many consumers labels are not an important consideration in product choice.
- Labels are an important conduit for producers to communicate with consumers.
- Simple language, clear font and/or simple graphics are critical for an effective label.
- Educating consumers is key to understanding label content.
- Technology has a role in enhancing consumers' informed decisions.

Conclusion

It is evident that there is significant demand from consumers for food labels with adequate information content. Nutritional and safety information is a priority for consumers but there is increasing demand for information about environmental, ethical and other concerns to appear on labels, as demonstrated by our survey findings. There is also evidence that disparities exist in understanding and use of labels between different groups and that standardisation and simplification of food labels could increase their use by consumers. Our key informant interviews found that while labels are an important vector for food information, several factors need to be improved to address underutilisation of labels by certain consumer groups. Improving label display and content, consumer education and use of complementary technologies may help to maximise the efficacy of labels as a mode of information transmission to consumers.

Recommendations

1. That country-of-origin labelling be mandated as a requirement for all packaged foods for sale.
2. That the government re-evaluate their position on taxation of unhealthy foods and drinks, for example sugar-sweetened beverages.
3. That the recently implemented Health Star Rating System be made compulsory.

4. That third party labels (for example independently-certified organic, free range and fair trade-produced food) are standardised.
5. That food manufacturers utilise innovative strategies of delivering food information, for example by the use of 'quick response' (QR) codes linked to further online information, where information delivery may be otherwise limited by packaging space.

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Introduction

Contemporary food production is undeniably complex, as the food industry becomes increasingly globalised and novel food products and processes are introduced. Moreover, developments including unprecedented global obesity levels (2) and technologies such as genetic engineering present numerous challenges to be navigated by producers and consumers. Food labelling is an important facet of consumer engagement with these issues, as labels provide consumers with information at the point of purchase, and so potentially influence purchasing behaviour.

In this report we consider the efficacy of food labels as a mode of communication with consumers, informed by a review of the literature as well as our own survey of shoppers and interviews with key industry informants. We describe current food regulations in New Zealand, comparing these with overseas requirements, and discuss whether labels are currently meeting consumers' expectations for information.

We identify groups who are less likely to read or understand food labels and examine potential reasons for this. In the New Zealand context, this includes groups such as Māori, Pacific and low-income consumers (3), suggesting that changes to food labels may not equitably increase consumer understanding.

Lastly we explore potential improvements to label format and regulations, and provide recommendations to maximise labels' efficacy as an information vector.

Aims

This report aims to:

1. Describe current labelling standards in New Zealand and compare these with international standards;
2. Discuss opinions of consumers and key informants regarding information contained on food labels;
3. Describe patterns of label use and understanding by consumer demographic groups, and barriers preventing use or understanding;
4. Explore the effectiveness of labels in encouraging behaviour change; and
5. Provide recommendations for improving food labelling and discuss alternative or complementary methods to enhance communication with consumers.

1. Literature review

1.1. Current food labelling standards in New Zealand

Food available for purchase in Australia and New Zealand is regulated by Food Standards Australia New Zealand (FSANZ), a bi-governmental agency established in 1991 (4). FSANZ has developed and administers the Australia New Zealand Food Standards Code (5) and the Ministry for Primary Industries (MPI) is responsible for enforcing the Food Standards Code in New Zealand (4). The Food Standards Code determines which food products need labels and what goes on those labels, for example, name of food, advisory/warning statements, and nutrition information (6). The Food Standards Code also specifies exclusion criteria for food that does not require a label, for example if the food is made and packaged on the premises that it is sold from, or is packaged in the presence of the purchaser is also specified in (6).

Table 1 below details both mandatory and voluntary aspects of food labels, how these appear on labels and the agencies responsible for their regulation.

Table 1. Voluntary and mandatory food label components in New Zealand.

| Dimension | How it appears on label | Mandatory/voluntary | Regulated by |
|---|--|---|---|
| <u>Nutrition</u> | | | |
| Content of food | Ingredients list, in descending order of quantity (7) | Mandatory if food is required to have a label (7) | MPI enforces the Food Standards Code which is developed by FSANZ. |
| Nutrition information | Nutrition information panel (7) | Mandatory for most packaged foods unless meets exclusion criteria stipulated in Food Standards Code 1.2.8-5 (7) | |
| Nutrition claims e.g. 'low fat' or 'less than x% fat' | Statement may be on front-of-pack but more detail must be in nutritional information panel (7) | Mandatory for claims about cholesterol, types of fats, fibre, carbohydrates, lactose, sodium as stipulated in Food Standards Code 1.2.8-6 (7) | |
| <u>Safety</u> | | | |
| Warnings | Advisory or warning statement | Mandatory for the following products: Advisory – sugar alcohols Warning – royal jelly (8) | MPI enforces the Food Standards Code which is developed by FSANZ. |

| | | | |
|--|---|---|---|
| Common allergens | Allergen statement e.g. “may contain traces of nuts” | Mandatory (8) | |
| Expiry date | As a use-by or best-before date | Date marking is mandatory. Use-by date mandatory if food is unsafe for consumption after that date. (9) | |
| Storage | Advisory statement e.g. keep refrigerated once opened | Mandatory if food is required to have specific storage to ensure suitability for consumption. (10) | |
| <u>Environmental impact/sustainability</u> | | | |
| Organic | Organic Certified Organic | Voluntary Voluntary - but must be able to back up claim with certificate from certifying organisation (11) | Must comply with Fair Trading Act 1986 (FTA) with regard to using the term ‘organic’. Use of the term ‘organic’ enforced by Commerce Commission (11) |
| Palm oil | e.g. “No palm oil” | Voluntary (12) | Must comply with the FTA. |
| <u>Animal Welfare</u> | | | |
| Free range | No set standard. | Voluntary | Farms audited by MPI to ensure food safety standards met but free-range label claims not included (13). Complaints about potential breaches of the FTA directed to Commerce Commission (13). |
| Fair treatment of animals | SPCA ¹ Blue Tick | Voluntary | Accreditation scheme run by SPCA NZ certifies animal products that are farmed to high animal welfare standards (14). |
| <u>Welfare of workers</u> | | | |
| Fairtrade | Fairtrade Mark on packaging | Voluntary | Must be certified by Fairtrade ANZ ² to use logo. Re-evaluated every 3 years (15). Commerce Commission investigates breaches of FTA. |
| <u>Cultural beliefs</u> | | | |
| Religious e.g. halal | FIANZ ³ Halal logo | Voluntary | FIANZ can provide certification for products for sale in the |

| | | | |
|------------------------------------|-----------------|-----------|---|
| | | | domestic and international market that are halal (16). |
| Ethical e.g. vegetarian/vegan | No set standard | Voluntary | NZVS ⁴ will allow producers to use their 'V' logo if they meet the vegetarian criteria that they stipulate (17). |
| <u>Country of origin labelling</u> | | | |
| Country of origin | E.g. Made in NZ | Voluntary | Not regulated under the Food Standards Code. Under the FTA, claims about product's origin must not be misleading or deceptive (18). |

1. Society for the Prevention of Cruelty to Animals
2. Fairtrade Australia and New Zealand
3. The Federations of Islamic Associations New Zealand
4. New Zealand Vegetarian Society

1.1. International comparisons

1.1.1. Australia

Australia has almost identical standards due to a combined overseer (FSANZ), with one key difference being that Australia does mandate country of origin labelling for those foods that are required to have a label (6). The Australian government implemented the voluntary Health Star Rating System in June 2014 at the same time as New Zealand, with the same idea of implementing the system over five years (19).

1.1.2. Canada

Health Canada (equivalent to New Zealand's Ministry of Health) regulates the labelling of food products in Canada (20) and it is enforced by the Canadian Food Inspection Agency (21). There are no major differences between New Zealand's and Canada's food label regulations. An independent front-of-pack labelling system called 'Guiding Stars' is used by some producer's to assist consumers with choosing healthier food options (22).

1.1.3. UK

England, Wales, Scotland and Northern Ireland all have separate but similar regulations which are set out by the Food Standards Agency (23). Currently, labels are only required to have a nutritional information panel if a health claim, for example "low fat", is made. Most manufacturers provide nutritional information voluntarily but, as of December 2016, new EU rules will require all foods that have a label to provide nutritional information (24).

In 2013, major supermarkets and some big brands in the UK introduced a Traffic Light food labelling system based on a charter drawn up by the Department of Health (25). There is evidence to suggest that the Traffic Light labelling system is more effective than the Health Star Rating System used in New Zealand with consumers better able to differentiate a product's healthiness using the Traffic Light label compared with the Health Star Rating System (26).

1.1.4. USA

The Food and Drug Administration is responsible for food labelling within the USA. There is no front-of-pack label system mandated by the Administration, with producers utilising front-of-pack labelling at their own discretion (27).

In response to a request from First Lady Michelle Obama in 2010 (28), the Grocery Manufacturers Association and the Food Marketing Institute developed the 'Facts Up Front' label in an attempt to provide a uniform front-of-pack label for food packaging in the USA (27). This label consists of four basic icons for calories, saturated fat, sodium and sugars (28). There is an option for additional icons for other nutrients like vitamins and minerals (28). This was introduced in January 2011 (29) and followed by a nationwide consumer education campaign in 2014 (30). However this labelling system has been found to be ineffective for those with low health literacy as it contains confusing numeric information which may be difficult for consumers to understand (27).

1.2. Consumer demand for information

1.2.1. Nutrition

Nutrition information is perceived to be a vital label component by a significant number of consumers, particularly in light of the global 'obesity epidemic'. Studies show that 25% to 50% of consumers read nutrition labels when purchasing a food product for the first time (31,32). Calories, fat, salt and sugar content are the most common concerns among consumers (32,33). However, despite awareness of the presence of nutrition information on food labels, actual use of the nutrition label when purchasing is generally low (33), with an observational study in United Kingdom finding that only 27% of consumers consulted the nutrition information before buying the product (34,35). Consumers' use of nutrition labels is mainly associated with their degree of interest in healthy eating (35). Many consumers report confusion about the terminology on the labels such as percentages of daily values or guideline daily amount (33). Many prefer simple text and coloured symbols such as the "Traffic Light" system currently in use in United Kingdom to represent the nutritional components (36,37), rather than complex terminology which requires a higher level of nutritional knowledge for interpretation.

1.2.2. Safety

Food safety information is also an important component of food labelling. Concerns about food safety are well founded, as misinformation or poor food handling practice can lead to serious consequences, including anaphylactic reaction to allergens and hospitalisations due to foodborne infections (38,39).

Food safety issues can arise from different aspects of the food production chain (38) and are communicated through label information such as production date, shelf life and expiry date, country of origin, microbial contamination, chemical contamination, allergen statements, genetically modified ingredients and cooking and storage instructions (40). Chemicals in food and foodborne illness from bacteria are reported to be the most concerning issues to consumers (41). Correspondingly, some of the most commonly read aspects of a label are

the best before dates or use-by dates¹, country of origin, genetic modification declaration, allergen statement and cooking or storage instructions (31,32,41,42). This demonstrates that food safety is an important consideration for many consumers, although individual factors and the product type being purchased will influence the extent to which label information is used (43).

Cooking and storage instructions are also important pieces of safety information that can be conveyed on a label, as unsafe food handling can increase the risk of food poisoning and foodborne illness through microbial cross-contamination or insufficient cooking (42). Nevertheless, such information is relatively poorly utilised by consumers (38,43). Only 7% out of 732 New Zealand respondents reported that they refer to handling instructions on the label of food bought for the first time (31). 57% of Australian respondents reported they do not always read and comply with the cooking instructions and 44% do not follow the storage instructions on food labels (42).

Finally, specific allergen information is a key component of labelling for food safety. Sufferers of food allergies tend to be more conscious of food label information than general consumers and are more likely to utilise the labels to avoid allergen exposure (43,44). However, 66% of people either with a food allergy themselves or with at least one family member with a food allergy reported having difficulties interpreting the food label information (45). Common problems include not understanding the terminology, multiple terms used for the same ingredients and absence of allergen statements on the product label (44,45).

1.2.3. Country of origin labels

Country of origin labelling is considered by consumers to be very important especially when the quality and safety of the food is perceived to be related to the country of production (46). For example, one study found that Americans tend to place greater trust in seafood imported from Canada rather than any developing Asian countries such as Thailand, Indonesia, China and Vietnam (47). Therefore, country of origin labelling can assure consumers of the safety and trustworthiness of a product, but conversely can lead to avoidance or stigmatisation of products from certain countries.

1.2.4. Sustainability, equity and animal welfare

There is increasing public awareness about the ethical and environmental impacts of industrial food production, with consumers no longer purchasing food solely using criteria that impact them directly and/or physically such as nutrition, safety and cost. Impacts of the industrial food system include carbon emissions and water consumption involved in meat production (48), unsustainably managed fisheries (49), deforestation for palm oil plantations (50), unethical coffee production (51) and mistreatment of livestock in industrial farms (52). Non-economic driving factors weighed up in food purchasing decisions now include altruism, social norms, ideas of reciprocal fairness, civic values, and political and moral ideas (49). Unsurprisingly however, cost still plays a role; consumers make price/benefit trade-offs when confronted with a variety of value differentiated products (53).

¹ Interestingly, the difference between best before dates and use-by dates is not well understood by many consumers (32,38,43), which may lead to consumption of expired food or alternatively wastage of food which is still safe for consumption (43).

Increasing consumer demand for organic, environmentally friendly, Fairtrade and animal cruelty-free products is evidenced by the growth in market size for such food. In 2015 the global market for organic food was US\$72bn and growing rapidly worldwide (54). In 2002, 27% of consumers in OECD countries were identified as 'green consumers' who had a strong willingness to pay for environmentally friendly products (49). A further 10% were 'green activists' who had a lower willingness to pay, and a further 40% were identified as 'latent greens' who had the potential to become green activists or consumers (49). As for concerns about equity of food production, global sales of Fairtrade™ products reached US\$7.4bn in 2014 and are also growing strongly (55). Information about animal welfare is also an important way for producers to differentiate their products. One study showed consumers value animal welfare even more highly than organic or carbon footprint labels and were willing to pay a premium of 43-93% for free range chicken products (56). There is therefore a significant competitive advantage for producers who can gain consumers' trust with respect to the ethical attributes of their products.

It has been suggested that ethical labelling needs to be improved to be of maximum usefulness to the consumer. Educating consumers is one possible method of improving the effectiveness of ethical labelling. Studies suggest that consumers who have been educated about the meaning of label claims are better able to interpret and use such labels, and perceive ethically labelled foods as more acceptable and of higher quality (57,58). Ethical labelling could also be improved by streamlining the labels themselves, as it is well accepted that a coherent labelling policy would help consumers to make informed choices (59). Trials of a comprehensive sustainability label that includes ecological, economic, and social values appear promising (60).

1.2.5. Cultural beliefs

Religion-specific food restrictions have led to increased usage of halal and kosher labels in multi-cultural communities like New Zealand. Diverse perspectives exist on the utility and effects of these labels. Some academics point to the commonalities amongst kosher, Christian, and halal food laws, and suggest that these laws can be used to improve animal welfare, the sustainability of industrial food production, and even nutrition of consumers through integration with traffic light systems to promote healthy food choices (61). However, studies have shown that while labelling for religious food laws increases the attractiveness of the product to that religious group, the religious label may also affect perception of a branded product amongst consumers who are not of the target group via a 'spillover effect' whereby mental schemata of a brand and of a religion are perceived simultaneously and combined (62,63).

1.3. Label use and understanding by consumers

Use of food labels by grocery shoppers is common but appears to be influenced by several factors including gender, age, socioeconomic status, education, ethnicity and time available (38).

International estimates of food label use by consumers vary between 70% (64) and 90% (65), with a New Zealand study finding that 82% of consumers report using food labels (66).

However, self-reporting is likely to overestimate actual label use by consumers while grocery shopping, and label use in practice may be as low as 4.2% (66). Females are consistently found to use labels more often than males (67–69). Older adults are reported to use labels less often (67,69), a trend that may be related to small font size which was identified as a barrier to label use (69,70). Lower income shoppers also use labels less often (3,64,67,70), while higher education status is associated with greater label use (64,67,70). Majority populations (Caucasian in the case of most studies) are frequently found to read food labels significantly more often than minority populations (66,67), giving rise to ethnic disparities in acquisition and use of nutritional and other information. Health-conscious consumers or those following a special diet often reported more use of labels (67,70,71).

Common reasons given by consumers for not using labels include disinterest (lack of motivation, interest or perceived relevance) and habit or previous positive experience (buying the same product as usual) (72). Other reasons for the non-use of labels include a large number of products to be compared and general dislike of grocery shopping (73). Time is a major constraint for many consumers (69,71). One study found that 25% of consumers always use nutritional labels while shopping, but a further 11% always use labels at home (64), indicating that more detailed information may be read at a later date. This is further supported by qualitative research in Australia and New Zealand that found that many consumers felt “‘rushed’ or ‘pressured’ to make a quick product decision in the store,” but would sometimes read labels later while cooking, eating or cleaning out the pantry (71).

Label use is not necessarily indicative of understanding however. While many consumers report using labels to inform purchasing decisions, information contained on labels is not always accessible to consumers. Consumers found to be best able to understand information on food labels were likely to be younger, Caucasian and female, and to be motivated, frequent label users (69). Self-reported understanding of nutrition labels is very low amongst Māori, Pacific and low income consumers (3).

Barriers to understanding include a lack of knowledge of scientific terms, vague or confusing language and insufficient detail (72). Scientific terminology commonly identified as confusing includes ‘sodium’ instead of ‘salt’, numbers for additives and ‘-ose’ words for sugar (71). Lack of understanding of the relationship between energy and calories, sugar and carbohydrate, grams per serving and grams per 100 grams also result in consumer confusion when reading labels (70). Qualitative research carried out in Australia and New Zealand indicated that very few consumers considered food labels contain too much information, but many expressed confusion and difficulty with interpreting the information that had been provided (71).

One challenge to adequately informing consumers is gauging the appropriate level of detail contained on a label. Consumers may request more information but this will often be ignored due to time constraints, decreased ability to process, boredom or impatience (74). The usefulness of labels on food products is further limited by the availability of space on the package, and the knowledge of consumers reading them (70). Label content and format is often dictated by legislation rather than being designed as a practical information source for consumers when shopping (70), suggesting that the end user of labels is not always at the forefront of industries’ and regulators’ consideration.

However, the challenges of producing comprehensible labels are not insurmountable. An international systematic review of nutrition labels provides suggestions for improving consumer comprehension of labels such as use of graphics or symbols, minimising numerical content, larger and more legible print, explanation of terms, and use of colour (69). It is also recommended that any changes in food labelling are accompanied by educational and awareness-raising campaigns to maximise consumer use of new label features (75,76). Consideration of both label format and associated consumer education can maximise their efficacy as a communication tool.

1.4. Labels' influence on consumer behaviour

As food quality becomes increasingly difficult to judge by traditional cues such as sight and smell, labels are an important tool to help consumers make purchasing decisions (73,77). Many consumers also incorporate information about the environmental and ethical qualities of a product into their purchasing decisions (49). However, the number of consumers reporting buying such items is markedly less than the number that signal their willingness to do so (49,59), indicating that increased labelling information alone does not always result in change in consumers' actual purchasing decisions (78). As discussed above, reasons for this include time limitations, understanding of terminology and consumer interest (70,71). In relation to the ethical labelling of food, the retailer-driven proliferation of standards and labels for organic, fair trade, and animal welfare foods – the so-called 'mainstreaming' process - is also partly responsible (79). This plethora of labels complicates purchasing decisions for consumers (60). Indeed, 89% of supermarket shoppers studied in the UK described confusion in interpreting and understanding ethical labels because of poor communication and market proliferation (59). Other important reasons why consumers may not opt for environmentally friendly or ethical food products include perceived high price and low availability, ingrained habits around food purchasing and lack of trust in labelling systems (80).

Nevertheless, studies have found that labelling containing 'buzz-words' can have significant impacts on consumers' trust of a product and willingness to pay. For example, additions to labels such as genetic modification statements can result in consumer aversion to products, even if no adverse health effects have been proven (77). Conversely, label additions that are perceived positively, such as 'organic', can carry other connotations in the minds of consumers such as increased health benefits, improved safety and environmental benefit, associations that are not always substantiated by evidence (77). This is known as a "health halo" effect and can considerably influence consumer behaviour (77). These examples demonstrate that label elements are not always interpreted by consumers as intended and can gain unexpected positive or negative associations that influence purchasing behaviour.

One study observed that consumers appear to be reassured by the presence of food labels even if they do not personally use them (73). Two explanations for this were given: firstly, labels give consumers the option of using the information, and secondly labels have existential value in assuring the consumer that food producers are supervised and accountable (73). This suggests that labels may serve a secondary, implicit role in reassuring consumers of food quality, as well as providing explicit information about food contents and processes.

1.5. Labels' influence on producer behaviour

As well as influencing consumer behaviour, labelling can also have a powerful impact on food producers (66,77,81). This is true of both voluntary and mandatory labelling (81). Voluntary labelling of positive attributes of a product creates an information deficit in other products in the same range, which consumers perceive as an absence of the attribute (81). This can be a significant motivator for the industry to make changes to their products in order to meet the voluntary labelling standard (81). In Australia and New Zealand, opt-in labelling of heart-healthy foods with the Heart Foundation Tick resulted in substantial reduction in the salt content of breads, margarine, and breakfast cereals (66). In the year from 1998 to 1999, the programme was estimated to have resulted in 33 tonnes of salt being excluded from these food types, including a 61% decrease in salt in reformulated breakfast cereals (82). In the United States, introduction of mandatory trans-fat labelling resulted in a mass movement of the industry to reformulate products to avoid the stigma of this label (81). Labelling of foods as 'low' or 'no' trans fat dramatically increased after the implementation of compulsory labels, with the number of 'zero trans fat'-labelled products increasing from almost none in 2002 to 5,459 in 2007 (81). This mandatory labelling programme had a self-propagating impact on food composition; manufacturers anticipated consumer dissatisfaction so reformulated products, which in turn created more knowledge of and demand for these products amongst consumers (81). It is clear then, that regulation of label content has the power to influence industry behaviour positively, when the presence or absence of certain label information may impact consumer demand.

Economic psychology provides a further reason for producers to engage with labelling initiatives. Interestingly, labelling is shown to have a powerful impact on consumers' sensory perceptions of a product. Labelling prawns as 'sustainably-produced' increased freshwater prawn acceptability to tasters and improved their sensory perception of the product (83), and participants tasting two identical coffees rated the one described as 'eco-friendly' more highly and were willing to pay more for it (84). Similarly, consumers who had been educated about label claims rated organically-labelled chicken meat as higher quality, fresher and juicier (58). Functional magnetic resonance imaging (fMRI) studies have even demonstrated possible neural mechanisms underlying the valuation of Fairtrade-labelled chocolate that explain why consumers find such chocolate tastes better than identical chocolate presented as conventionally produced (85). These studies show that producers who follow sustainable and ethical practices and/or label their products as such, could potentially benefit from differences in customer perception.

However, standardisation of labelling is essential to ensure that the consumer has adequate information on which to base a decision. If supermarkets and producers are not held to high standards for labelling or certification schemes, problems with food production remain unaddressed, as in the case of the designation of eggs as 'free-range' in Australia (86). Transparency about standards for labelling is crucial in improving the efficacy of labelling systems in empowering consumers. It is likely that the regulation of producers and labelling bodies, as well as consumer education, will be necessary to improve ethical labelling systems.

1.6. Balance between consumer freedom and regulation

Public opinion differs as to the relative importance of consumer autonomy and governmental regulation in ensuring food safety. Understanding of the complexity of the food chain and the role of the consumer varies (75,87). A British study found that consumers believed themselves to have total or near-total responsibility for their own safety (88), with the majority of respondents considering the probability of illness after consuming food prepared at home to be very low, showing that more faith is placed in interventions over which the consumer has control. Conversely, another study showed that over time self-reliance for food safety has decreased and consumer reliance on manufacturers and supermarkets has increased (89). These findings have implications for consumer perceptions of the acceptability of different interventions to ensure food is safe to consume. Overall it appears that consumers value self-reliance in matters of food safety but the increasingly complex regulatory role of supermarkets and manufacturers means that interventions that rely solely on the consumer may not be effective or acceptable to everyone.

Interventions at various stages of the food processing chain are often cost-effective but may be of varying acceptability to consumers. Interventions at the primary processing stage of poultry production provide the most substantial benefit and lowest cost-effectiveness ratios (90) (Lake, 2013). Interventions requiring major capital investments such as new equipment and irradiation are less efficient in reducing the public health burden and consumers find these less acceptable (90,91). Also interventions requiring major capital investments tend not to be favoured by producers due to cost, time and logistics of having to implement these changes. On the other hand, education about safety and hygiene is not presently as cost effective as interventions at the primary processing stage (90). A study of Scottish consumers indicated that they would be more willing to accept new interventions that have been informed by public input rather than those imposed by government and industry (91), emphasising the importance of public consultation in ensuring maximum consumer engagement with interventions.

1.7. Harms and equity issues in food labelling

The main costs incurred by changes in labelling are financial, and include costs to the manufacturer of implementing new labels, costs to agencies of regulation, and potential lost income if consumers react unfavourably to label changes (77). While food labelling regulations may lead to spontaneous industry reformulation of products, an unintended consequence of this may be that costs incurred through processing changes are transferred to the consumer, whether or not they supported the reformulation (81). The cost of changes to the label itself can also be passed on to consumers, disproportionately affecting low-income consumers (77). The real or perceived association between positive label attributes and increased price can reduce the self-efficacy of low-income consumers, as seen in a New Zealand study where one low-income consumer stated, "If something is good for your health we can't buy it." (3). This viewpoint demonstrates that changes to a product recipe or changes to the label may generate costs that place healthier products out of the reach of those on a limited budget.

Benefits of changes to labels include greater consumer knowledge and autonomy. However, as mentioned previously, food labels are used disproportionately by certain consumer

groups leading to disparities in benefits gained from any labelling changes. In New Zealand, lower rates of label use are reported amongst Māori, Pacific and low-income consumers (3). Māori participants in a qualitative study (3) cited similar reasons to average consumers for label non-use (lack of time, difficulty understanding terminology), but also described other perceptions such as “healthy foods are more expensive and therefore looking at nutrition labels is a waste of time” and “Māori buy budget, [the Heart Foundation Tick] doesn’t speak for them.” Members of the study’s Tongan focus group expressed a desire for “labels to have bright colours, more pictures, less writing and to be in Tongan” (3). Low-income consumers also found food labelling irrelevant with 80% never using nutrition information on food labels, often due to the perception that they would be unable to afford healthy foods so the information was inconsequential (3).

The lack of perceived applicability of food labels amongst Māori, Pacific and low-income groups indicates that any changes made to food labels are less likely to be as effective in these populations as in other groups more accustomed to the use of food labels. This is an important consideration, and interventions should seek to incorporate suggestions from these groups on improving the communication of information. Possible interventions identified by these groups include easier-to-interpret labels which incorporate graphics, healthy eating cues throughout the supermarket and education about healthy eating within the community, for example speakers at Tongan churches (3).

1.8. Challenges of food information communication

Communication of information about food content and processing poses challenges, particularly in overcoming the lay-expert communication barrier (92). As previously stated, consumers often identify lack of clarity of label terminology as a barrier to comprehension. Experts also cite difficulties in communication via the media. Risk of professional reputation, lack of control over the final message format and tension between being scientifically correct and avoiding overreaction from the public have been identified by scientists as barriers to communication with the media (92). The message delivered needs to be perceived by the audience as relevant and credible, and members of the public need to have sufficient motivation and self-efficacy to act on this advice (92).

Traditionally, communication about food risk has been viewed under the ‘knowledge-deficit’ model, with information flow occurring in one direction only (92). However the delivery of a standardised message to a heterogeneous audience is unlikely to be effective, so greater collaboration between experts and the public has been encouraged (75,92). Consideration of the sources from which consumers receive information is vital. A study in the United Kingdom in 2005 (93) categorised consumers into five groups based on where they received their food safety information: media, food chain, authorities, alternative and independent. Of these categories of consumers, the ‘media’ and ‘authorities’ groups were most likely to trust product labels, and the ‘alternative’ and ‘independent’ consumers were less likely to. This finding demonstrates that increasing food label information will not have an equal effect at improving consumer knowledge, as food labels are not universally regarded as a trustworthy information source. Increasing the perceived trustworthiness of labels by measures such as advertising, education in schools and collaboration with animal welfare and environmental organisations may therefore help to engage groups less likely to use labels as an information source.

1.9 Literature review: Key findings

- Most developed countries have regulations governing food labelling, mostly regarding nutrition and safety. There is an international trend towards simple graphical labels for nutritional information e.g. traffic light or star rating systems.
- Information about nutrition and safety is prioritised by consumers.
- Consumers are increasingly demanding information about other aspects of food (e.g. country of origin, environmental impact, animal welfare and other ethical concerns).
- There are differences in the way people use and understand labels. Young, highly educated, wealthy, female, and ethnic majority consumers are more likely to use and understand labels than older, less educated, poorer, male and ethnic minority consumers.
- Food labelling can positively impact both consumer choices and food industry behaviour.
- Labelling alone is not particularly effective at changing consumer behaviour. Some barriers include confusion due to label proliferation, lack of trust in labels, time constraints, and lack of interest/understanding.
- Standardisation, simplification, improved graphical design, transparency and education in relation to food labels would increase their utility to consumers.

2. Survey of shoppers

Having identified from the literature the existence of a gap between consumer desire for information and what is provided on food labels, we developed a survey to assess consumer opinions about food labelling. This survey was conducted with the aim of quantifying consumer desire for information on food labels and assessing public opinion on the usefulness of labelling.

2.1. Study design

We conducted a street-intercept survey of 401 food shoppers during a 7 day period (19-25th April 2016). Surveying was conducted at entrances to supermarkets and butcheries in the cities of Wellington, Lower Hutt and Porirua, New Zealand. Twelve supermarkets (comprising four major New Zealand supermarket chains) and six butcheries were selected in suburbs with a range of socio-economic deprivation scores from the NZDep 2013 index, which assigns a deprivation index to census area units (94). Surveys were conducted throughout the shopping day (supermarkets 0900-2100 hrs, and butchers 0900-1700 hrs) to reflect the changing demographic composition of shoppers at different times of day (95).

2.2. Participant recruitment

Shoppers, defined as anyone entering or leaving a supermarket or butchery, and aged 16 years or older were eligible to participate. Potential participants were approached and offered the opportunity to take part in this study. Refusal to participate was defined as declining after being informed of the topic of the survey and the expected time commitment (5-10 minutes). All recruited shoppers provided written informed consent prior to study participation. Appendix 1 contains the participant information sheet and consent form. Ethical approval was granted by the University of Otago Human Ethics Committee.

2.3. Survey design and delivery

We devised a survey to assess respondents' perspectives on food labels, chicken-specific practices and beliefs, and views on labelling of chicken products. The survey consisted of 36 questions, divided into 7 sections (A-G).

- Section A comprised of general interview detail and determining if the participant was the main shopper for their household.
- Section B investigated shopper views on the necessity of certain types of information on food labels. For example, aspects of food safety, nutrition, welfare considerations and value for money.
- Section C examined participants' use of food labels, whether labels were thought to contain all necessary information and general views on food regulation.
- Section D asked participants if they bought, prepared or cooked chicken and if so, the type of chicken product. We also assessed frequency of fresh chicken preparation, awareness of bacterial contamination of chicken products (including *Campylobacter* contamination) and beliefs on safe chicken preparation.
- Section E evaluated shopper views on the necessity of certain information types on poultry labels.
- Section F asked participants to select from three chicken product labels the most effective at communicating safe chicken preparation information to them (see Appendix 3).
- Section G collected demographic information, including suburb of residence as a proxy for socioeconomic deprivation.

This report includes data from sections A-C, and G. Results from sections D-F appear in our complementary report, "Consumer attitudes towards food labelling: Is chicken literacy a solution for campylobacteriosis?" (1). Appendix 2 contains the survey form. Questions were read aloud by the interviewer in a prescribed format. Four showcards were provided to participants as visual aids in answering the questions. These showcards are presented in Appendix 3.

2.4. Statistical analysis

Suburbs of residence were matched to New Zealand census area units to assign a deprivation index (94). Where a suburb was partitioned into multiple census areas, we took the average deprivation index for these areas. Once averaged, we rounded the value to the nearest integer. For example, Johnsonville is separated into Johnsonville North, East and

Centre with a deprivation index of 2, 3 and 5 respectively. For this study, the deprivation of Johnsonville as a whole would therefore be 3.

Two-tailed Spearman's rank correlation coefficients were used to assess trends in labelling preferences with deprivation. To determine if these preferences differed between ethnic groups (Māori vs. Non-Māori, Pacific vs. Non-Pacific, Asian vs. Non-Asian) we used the Mann-Whitney U test. Statistical analyses were performed using SPSS (SPSS Statistics version 23.0 for Mac OS X, IBM, Armonk, NY, USA). All data are expressed as median (interquartile range (IQR)), or as the number (%) of participants, unless otherwise stated. Alpha was defined as $P \leq 0.05$. Figures were generated using Prism (GraphPad Prism version 6.0h for Mac OS X, GraphPad Software, La Jolla, CA, USA).



Figure 1. Suburb locations where supermarket and butchers were sampled at in the cities of Wellington, Lower Hutt and Porirua. NZ Deprivation Index 2013 bracketed.

2.5. Methodological Considerations

This study had important strengths and limitations that should be considered when interpreting the findings.

First, due to the street-intercept nature of the survey, we adopted a concise survey that took an average of 5 to 10 minutes to complete in order to maximise participation rates. A pilot trial was also conducted to test reception and feasibility. To achieve a degree of consistency in the delivery of the survey between surveyors, our survey was designed with standardised statements for each surveyor to read out. The validity of certain survey data (in Section C for example), may still be affected by acquiescence bias, where there is a tendency for

participants to agree rather than disagree with all the statements read out by the interviewer despite its content (96). However, the Likert Scale which was used in our survey consisted of a balance of positively and negatively worded items, which helped minimise and control for this particular bias (96).

Social desirability bias may also occur where participants avoid presenting themselves in an unfavourable manner. This may have affected participants' answers to questions about the necessity of information on food labels. It is possible that consumers answers were impacted by impression management factors rather than solely on their personal opinion particularly when answering questions about sensitive topics such as the welfare of workers (i.e. fair trade) and other ethical concerns (84). This should be considered when interpreting these results.

Second, with the use of Likert Scale to measure participants' attitudes in our survey, we had to ensure certain assumptions were not being made. The assumption that the intervals between values on a Likert Scale are equal is incorrect, as Likert Scales fall within the ordinal level of measurement, i.e. the response categories have a rank order (97). It is incorrect to assume that the intensity of feeling between "strongly disagree" and "somewhat disagree" is equivalent to the intensity of feeling between other consecutive categories in the Likert Scale, for example between "neither agree nor disagree" and "somewhat agree" (97). This feature is important to take into consideration because it affects the appropriate descriptive and inferential statistical methods to be used in the analysis and correct interpretation of our results (97). In this case, we reported the median (and interquartile range) as the measure of central tendency as opposed to the mean (and standard deviation) which is normally used for interval variables (97).

Third, we aimed to minimise selection bias by approaching all shoppers entering and exiting supermarkets and butcheries in our sampling frame. Selection bias can cause problems with confounding but is inevitable in a non-randomised survey situation. Although our surveyors approached any individual coming in/out of the supermarkets and butchers females and New Zealand Europeans tended to consent to the survey more than others.

Fourth, we sampled our shoppers to provide a reasonable representative sample of the Wellington population, to support generalisability of the results (95). By using a number of survey locations across a range of deprivation levels (Wellington City, Lower Hutt and Porirua), we attempted to get a representative sample of different types of shoppers across different times of the day (0900-2100) and throughout the week and weekend. We completed 124 (31%) surveys in the morning (9am-1pm), 181 (45%) in the afternoon (1-5pm) and 94 (24%) in the evening (5-9pm), with fewer surveys completed in the evening session as a result of butchers being closed during this time. 78 surveys (19.5%) took place over the weekend. One limitation to generalisability, was Māori were underrepresented in our sample with 10% of our survey participants identifying as Māori compared with 14.9% of the total New Zealand population (98). 62% of our participants were female which is slightly lower than the 72% urban female main household shoppers found by Nielsen Consumer and Media Insights (e-mail from Nielsen Consumer and Media Insights, April 27, 2016; unreferenced).

Fifth, we assigned socioeconomic status to participants based on their suburb of usual residence. We did not attempt to assign socioeconomic status at the individual level (99). Percentage of participants in each NZDep decile in our study ranged from 3-17% of total participants.

Finally, we did have some missing data due to a few reasons. The majority of missing data in our survey was from item non-response which arose from participants refusing to answer a question or surveyors failing to ask a question or record an answer (100). We also had some missing data due to partial non-response which occurred in a few cases when participants had to leave before they completed the survey. All available data for each question were analysed, we did not use imputation for missing values. The cause of missing data largely influences the impact it has (101). Where data are missing randomly this has little effect on the result as there is no systematic difference between participants with and without data (101). When data are missing in a systematic pattern there is a possibility for bias to be introduced (101). There was very little missing data in this study so this bias is unlikely to affect the findings.

2.6. Results

Participant characteristics

We surveyed 401 shoppers out of 584 approached, for a response rate of 69%. 397 participants completed the entire survey and contributed towards the demographic characteristics summarised in Table 2. We achieved a minimum of 396 responses for all questions, with nominal data points missing due to participant refusal to provide a response, participants leaving prior to the end of the survey, or surveying error. All available data for each question were analysed.

The median age group of participants was 40-49 years (IQR, 20-29 - 60-69 years). 61% (246/396) of shoppers surveyed were women. Our participants were mainly of New Zealand European ethnicity, comprising 76% (299/396), followed by Other: 13% (50/396), then by Māori: 10% (40/396). Most were the main shopper for their household (82%, 329/399). More than half (62%) of our participants were in the less socioeconomically deprived deciles 1-5.

Table 2. Demographic characteristics

| Age, years* | |
|-------------|----------|
| 16-19 | 20 (5%) |
| 20-29 | 90 (22%) |
| 30-39 | 60 (15%) |
| 40-49 | 60 (15%) |
| 50-59 | 66 (17%) |
| 60-69 | 56 (14%) |
| 70-79 | 34 (9%) |
| 80+ | 11 (3%) |

| | | |
|--|-------------------------------|-----------|
| Sex* | | |
| | Female | 246 (62%) |
| | Refused | 1 (<1%) |
| Ethnicity[†] | | |
| | New Zealand European | 299 (76%) |
| | Māori | 40 (10%) |
| | Pacific [‡] | 22 (6%) |
| | Asian [§] | 27 (7%) |
| | Other ethnicity | 50 (13%) |
| | Don't know | 5 (1%) |
| | Refused to answer | 2 (<1%) |
| Deprivation index, 1=least deprived, 10=most deprived[#] | | |
| | 1 | 41(11%) |
| | 2 | 64(17%) |
| | 3 | 45(12%) |
| | 4 | 23(6%) |
| | 5 | 62(16%) |
| | 6 | 37(10%) |
| | 7 | 13(3%) |
| | 8 | 54(14%) |
| | 9 | 23(6%) |
| | 10 | 23(6%) |

Data are n (%). *n=397. [†]n=445. Where more than one ethnic group was reported, participants have been counted in each applicable group. However, the total responses for ethnicity (n=396) has been used to calculate %, and therefore the total % is >100%. [‡]Comprises Samoan (n=12), Cook Island Māori (n=5) and Tongan (n=5). [§]Comprises Indian (n=14) and Chinese (n=13). ^{||} Other ethnicity may contain Pacific or Asian groups not specified in the above groupings. [#]n=385.

Perceived necessity of types of information on food labels

Figure 3 presents participants' perceptions on food labelling. The majority of responses for all assessed categories were rated 3 (moderately necessary) or above. The most essential piece of information that consumers believed should be on a food label was 'safety for vulnerable groups' with a rating of 5 (IQR 5-5). This was followed closely by 'food safety to protect from infectious disease' with a rating of 5 (IQR, 4-5). In contrast, the perceived least necessary piece of information was 'energy in food', with a rating of 3 (IQR 3-4).

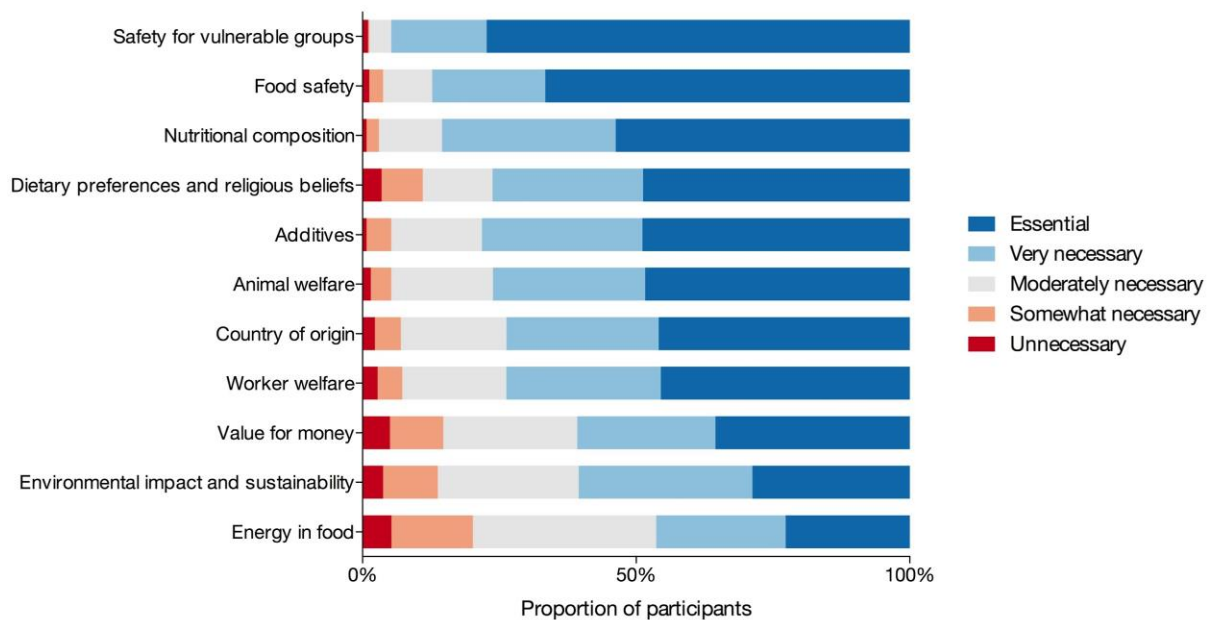


Figure 3. Perceived necessity of certain types of information on food labels (n=397).

Figure 4 shows responses concerning use of food labels. 62% of respondents reported either ‘somewhat agree’ or ‘strongly agree’ when asked about reading a label when purchasing a product for the first time (median 4, IQR 3-5). In contrast, only 34% of consumers gave these response options when asked if they believed food labels currently contain the information they need (median 3, IQR 2-4).

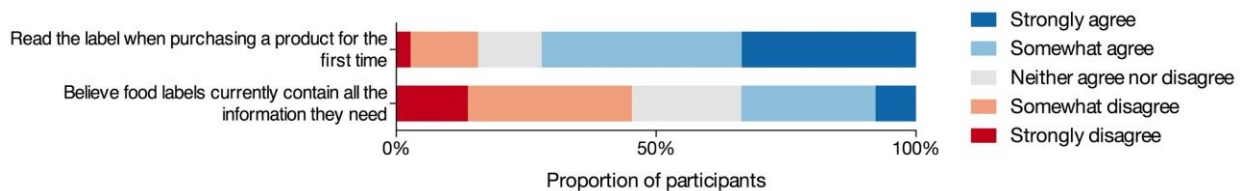


Figure 4. General views on food labelling

Distribution of responses for the extent to which shoppers agree with use of labels when first buying a food product and whether labels contain all the information they need (n=399).

Figure 5 presents results for participant agreement on various aspects of food regulation. The majority of respondents (87.2% ‘strongly agree’ or ‘somewhat agree’) agreed that consumers should be given all the information about foods so they can decide for themselves’ with a median rating of 4 (IQR, 4-5). Greater than 50% of participants agreed (‘strongly agree’ or ‘somewhat agree’) that the government should tax unhealthy foods and drinks, and believed the government should prohibit foods that are, for example, unhealthy for people or bad for the environment. While the median rating for both questions was 4, the IQR demonstrated a wider spread of responses (2.5-5 and 3-5 for government taxation and government prohibition, respectively).

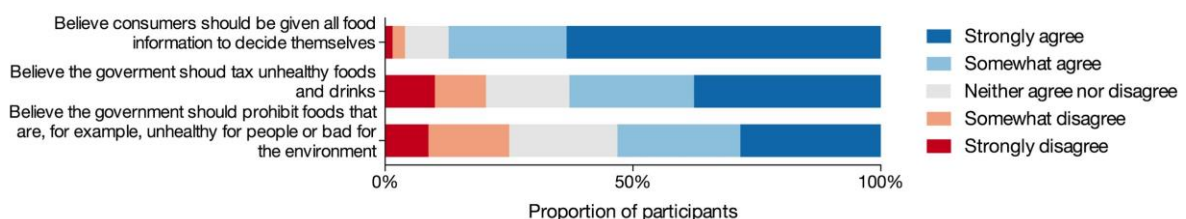


Figure 5. General views on food regulation

2.7. Survey of shoppers: Key findings

- Consumers believe a wide variety of information is necessary on a food label, with information about safety for vulnerable groups, food safety information to protect from infectious disease and nutritional information rated essential by the majority of respondents.
- Consumers agreed that they should be given all information about food items so that they could make informed purchasing decisions.
- While most consumers reported using a label when first purchasing a food product, a minority agreed that current labels meet their expectations for information content
- A majority agreed that the government should tax or prohibit certain types of foods, however opinions on these strategies were mixed

3. Key informant interviews

These interviews were carried out with the aim of acquiring qualitative evidence regarding food labelling and food regulation, to add greater depth to our analysis and to complement other aspects of the report.

3.1. Methods

3.1.1. Recruitment and interview

We conducted interviews with key informants to generate qualitative evidence regarding the labelling, regulation, production and safety of food. Key informants from the fields of microbiology, public health, consumer affairs, health promotion, food production and food labelling regulation were approached to be interviewed in person or by telephone. Interviews were conducted with experts in health promotion, microbiology, consumer affairs, marketing and regulation of food labels.

Interviews were conducted by a single researcher using a standardised set of questions. The questions were split into two sections: (i) General food labelling, and (ii) *Campylobacter* and chicken, with information regarding general food labelling informing this report and information regarding *Campylobacter* and chicken appearing in our complementary report, “Consumer attitudes towards food labelling: Is chicken literacy a source for campylobacteriosis?” (1). All interviews were recorded with consent either by dictaphone in the case of face-to-face interviews, or by recording app in the case of phone interviews. The interviews were then transcribed for analysis and transcriptions were made available to the expert after the interview to allow any corrections to be made. At the conclusion of the interview experts were asked to complete the same survey that had been used in our street-intercept survey of the general public (see appendix 2). This questionnaire was completed either independently or with guidance from the interviewer.

3.1.2. Key informants

Philippa Hawthorne (PH) - MPI Food Science Division

Glen Neal (GN) - General Manager FSANZ

Mary-Ann Carter (MAC) - Manager of Nutrition and Physical Activity, Health Promotion Agency

Consumer NZ (CNZ) - Consumer Advisory Service

3.1.3. Analysis

We conducted a thematic analysis of our interviews. First, interviews were transcribed, then key themes across multiple interviews were identified. These themes covered utilisation of labels by consumers, the important qualities of labels, consumer education for enhancing label understanding, and the role of technology in improving consumer self-efficacy to make informed decisions. Next, these themes were codified and assessed for concordance.

We analysed the expert responses from the consumer survey independently from those of the general population. We identified common responses from the experts and compared them to the responses from the general population. A response of 1 or 2 on the necessity or agreement scales was taken to mean 'unimportant', 3 was considered 'neutral' and a response of 4 or 5 was considered 'important'. For the purposes of the expert-public comparison, this definition was also applied to consumer responses.

3.2. Results

Several overarching themes became evident from the thematic analysis. These were: food labels were generally underutilised by consumers, food labels provided an opportunity for consumers to make informed decisions; consumer education was essential to understanding the food label; adjunct technology services played a role in further informing the consumer.

Food labels are underutilised by consumers

Participants described the scope of food label utilisation by general consumers. They identified a subset of consumers who fully engaged with labels and read them thoroughly. For this group labels are key to dictating their purchase choice behaviour, while for other consumers labels are a much less important consideration.

“MAC There’s the type of consumer we call the informed group and they’re the consumers who are really interested in food labels. So they want to know all sorts of things, they want to know what’s in the foods where the foods come from. They really want to know they’ll go look, if you put a health star or a cancer tick or any other front of packaging label like that, they will go and find out about that decide whether it’s credible or not and whether they want to keep that and use it. And then you have two other groups who see some of this stuff as ‘yeah it’s interesting, but I’m really too busy’ so there’s heaps of barriers to using food labels and a third group who’s totally not interested at all.”

One reason given for increased likelihood of using labels was the presence of certain dietary requirements.

“GN ...obviously there’s people that have particular dietary requirements, they might be gluten free....they might be shopping for someone in their family who has a food allergy so there certainly a proportion of consumers that pay a great deal of attention to labels.”

Generally consumers are thought not to look at information on the label to the degree where it would contribute to whether or not they purchased a particular product and that largely this information is overlooked.

“GN [the nutrition information panel] has largely kind of become background material that people might read from time to time but certainly aren’t using to inform purchasing decisions.”

Informants also described general behaviour of consumers in regards to reading labels. This was described being too short a period, in one example being less than 2 seconds.

“Interviewer: And do you think consumers read labels when making purchase decisions and do you think such changes consumer behaviour
PH Not by itself no. Apparently there is research that says how long people look at labels and it’s escaped me at the moment, it’s something ridiculous like two seconds or something on average is what people spend at looking at a label so the reality that they’re reading at that point is pretty low.”

Participants also challenged ‘typical’ survey results when asking consumers whether they read the label and whether this influenced their purchasing decisions. It was suggested that ‘typical’ responses from those surveyed tended to deviate from actual behaviour in reality due to social acceptability and other social biases. Thus, participants questioned recommendation to change consumer behaviour based on consumer based surveys.

“GN I think if you ask consumers, I think that they’d tell you they read labels prior to making purchase decisions but you put a webcam in a supermarket ... I don’t think you see people paying particular attention to a label.”

Participants also identified other possible reasons for consumer behaviour towards labelling. Labels tended to be overlooked due to limited time and other considerations such as budget. Thus consumers tended to rely on habitual buying (choosing items they have purchased previously), brand recognition and price.

“PH As I say, I can’t quote the research off the top of my head but there is stuff that’s looked at what do people look at and a lot of people almost robot shop, you know they go in they buy what they bought last week that they know has run out at home they know the brand ...it’s just automatic.”

“MAC “It’s not just the label per se. It’s not just a label to say, for example, canned peaches. It’s Wattie’s canned peaches. You know, when it’s a branded

product, that brand is very strong on whatever you buy...We know that people are very loyal to their brands."

"Interviewer: [Do you think consumers read labels when making purchasing decisions? Do you think such information changes consumer behaviour?]

MAC No. It's mainly cost. Cost and taste. Cost first taste second."

Price of a product was particularly important to low income households, in which product cost had a stronger influence on purchasing power and limited the options available to them. Their decision was mainly to buy as much as possible with limited resource.

"MAC ...They're really constrained by what they are going to buy. So what they're buying is what they can afford to buy and it's what they buy every week. And they're not interested in health, they're not interested in labelling...They're trying to feed their families and trying to make food go as far as they possibly can."

Food labels are important for consumers to make informed decisions

There was a general consensus as to the role of food labelling. It was seen as an interface between the manufacturer or producer and the consumer. It served to provide relevant information about the product, including mandatory health and safety information, nutritional information and ingredients.

"Interviewer: What do you think are the main purpose is of food labelling?"

PH It's basically the interface between the industry and the consumer to tell them what they need to tell them about the product"

By providing standard information, the label allows consumers to make informed choices about the food they purchase and enables comparison of products.

"GN We're very much lined up with FSANZ's objectives which are about public health and safety and consumer protection it's our primary objective... Secondly it's about enabling informed choice for consumers so we recognise that people have value systems that mean that they either want to have discretion about what they feed their kids or what they feed themselves so food labelling is all about enabling consumer choice."

The mandatory information displayed also ensures transparency from the manufacturer making sure that the information is correct, further enhancing the consumer's ability to make an informed choice when purchasing food.

"GN ...And thirdly our third tier if you like relates to preventing misleading conduct. So it goes through that informed choice a little bit. It also goes into regulating that relationship between buyer and seller"

"MAC ...To some degree [the food label] keeps food manufacturers honest, if you like. There's a whole bunch of regulations about what goes on a food label and what goes in the food... If you didn't have that regulation they could put whatever they wanted..."

An example of informed choice aspect of the consumer relates to health reasons, where ingredients play a vital role in regard to allergies.

“PH ...my daughter was diagnosed gluten intolerant though I’ve never read ingredient lists and suddenly I was reading all the ingredient lists...”

As well as mandatory information, voluntary information was also discussed. This is information that was provided by the manufacturer but was not necessary under legislation to be displayed on their product. Voluntary information was considered to be an economically-driven addition to labels by producers to reflect consumer values and beliefs.

“PH if people are demanding that from the companies, the companies that don’t put it on will lose sales and so they put it on so there’s almost no need for regulation”

“CNZ: There’s also strong demand for country of origin labelling, where the ingredients are coming from. Consumers are also increasingly wanting to know about health aspects of the food they’re eating, so information about high-fat high-sugar foods.”

Educating consumers is key to understanding label content

Education of consumers was a predominant theme relating to maximum use of food labelling in making informed decisions.

“CNZ The research that’s been done suggests that important information, like the nutritional information panel, consumers don’t spend the time to read them. Often because they’re not easily interpreted. So you do actually need to know a bit about how the information is displayed and what it’s actually telling you.”

Labels also served a useful purpose as “triggers” to remind consumers of previous education through other campaigns, for example the ‘5 Plus a Day’ campaign which encouraged consumption of five servings for fruit and vegetables per day as part of a balanced diet. Although the full information was not provided, the label was instantly recognisable.

“PH Often little icons or things will be put on a label which is the trigger... [It] might be something that you’ve seen on TV or seen on a website or that you’ve learnt at school ... for example Five Plus a Day, it’s of huge meaning because there’s been a campaign ... everybody knows about it, so that little thing on the label is the trigger that goes back to all that information”

Technology has a role in enhancing consumers’ informed decisions

Several adjunct technology-based interventions were identified by participants who thought these could provide more information about the product, without overwhelming the consumer with the initial label. This would not replace the label, but instead provide additional information about the product without jeopardising the limited space for mandatory health and safety information. Interventions such as quick response (QR) or barcode scanning which would enable the consumer to scan the product of interest on their communication device and access information of interest.

“PH ...certainly, you know there are possibilities there and industry are already using that to give people more information, there’s smartphone apps and all sorts that you can... find out different things, whether it’s nutrition information, whether it’s the origin information or is it organic... there’s all sorts of opportunities there.”

Social media sites such as Facebook or Twitter were identified as possible avenues to explore as a possible outlet for provision of education about food. FSANZ acknowledged their growing presence on social media, which they utilise to communicate corrections to misconceptions regarding food labelling as well as further informing consumers about food.

“GN ...we’ve got more than thirty thousand followers on social media now. So on a daily basis we’re via twitter and Facebook for example we’re getting this, we’re telling our side of the story as it were and developing that narrative and making sure there’s enough people out there who are informed...”

Results of key informant surveys

Six completed consumer surveys were collected from the key informants. Five of the six key informants believed that food safety-related information (proper handling and storage) was important to be put on labels and this was consistent with the views of the general population who completed our survey. All six of the key informants believed that information for vulnerable groups (e.g. those with nut allergies) was important to be put on labels, which was also consistent with the general population.

3.3. Key informant interviews: Key findings

- A subset of consumers uses food labels thoroughly, but for many consumers labels are not an important consideration in product choice.
- Labels are an important conduit for producers to communicate with consumers.
- Simple language, clear font and/or simple graphics are critical for an effective label.
- Educating consumers is key to understanding label content.
- Technology has a role in enhancing consumers’ informed decisions.

4. Discussion and synthesis of findings

Labelling of packaged food in New Zealand compares well internationally. In New Zealand mandatory labelling exists for safety and nutrition information - aspects of greatest concern to consumers - and further options for voluntary labelling of other characteristics such as ethical, environmental and animal welfare standards. Nevertheless, there is room for improvement. The results from our literature review and public survey clearly demonstrate that there is demand for more information on labels about a wide range of dimensions regarding food production and use. Despite variation in consumers’ opinions of the relative importance of these dimensions, virtually all consumers agreed that they should be given all information about foods so they can make informed purchasing decisions.

It is indisputable that food labels are one potential way of informing consumers' choices; this is one area where findings from the literature review, survey and key informant interviews converge. Clear, comprehensible and trusted labels can rapidly convey information to consumers at point of purchase and help them select products that best align with their nutritional and ethical priorities. It is for this reason that there is movement internationally towards simple graphical labels for nutrition, such as traffic light or star rating systems. From producers' point of view, good labelling can differentiate a product in a crowded marketplace, and our literature review describes the effects of labels on consumers' sensory perceptions of food products.

However, our literature review and key informant interviews reveal some potential issues in the use of labelling as an intervention to improve consumer understanding. Despite high levels of reported label use by consumers and the strong demand for more information elicited in the survey, studies show that label use in practice is much lower than consumer reports might suggest - a fact reflected in our key informant interviews. Reasons for this inconsistency described in the literature include confusion due to label proliferation, lack of trust in labels, time constraints, and lack of interest/understanding. Importantly, this last factor suggests that those consumers who are better informed in the first place are better able to take advantage of label information, leading to an exacerbation of inequalities in the knowledge of disparate groups of consumers. Indeed, the literature shows that young, highly educated, wealthy, female, and ethnic majority consumers are more likely to use and understand labels than older, less educated, poorer, male and ethnic minority consumers.

It is crucial to understand that the limitations described above are not inherent to labelling, but are instead problems with *how* labels and labelling systems have evolved, been designed, and implemented. Knowledge gained from the literature and key informants has helped us develop recommendations for maximally effective labelling interventions. Firstly, unmet consumer needs/demands regarding food product information should be identified and addressed. Preferences and knowledge about food products is constantly evolving, and it is advantageous to all parties - consumers, producers, and society - to have these needs met. Secondly, comprehensibility of labels is paramount. Expertise from diverse fields including psychology, nutrition, anthropology, and graphic design is necessary to craft a label that is meaningful, comprehensible, and appropriate for all consumers; this understanding has recently begun being incorporated into labelling systems such as the traffic light system. Proliferation of labels must be limited and standardisation applied if consumers are to make meaningful comparisons between products. Finally, labels alone are not sufficient to change consumer behaviour. Education must also be provided, and should be targeted towards high-need groups, such as the elderly and ethnic minorities. Innovative use of technology can play a role in this respect.

5. Recommendations

From our literature review and survey we discovered that there was a 'gap' between information consumers want on labels and what is currently provided by producers. There are also deficiencies in the clarity of information presented on food labels, which may

disproportionately affect certain socioeconomic and ethnic groups. The literature shows that food labelling can be effective in changing consumer and food industry behaviour. Therefore we have suggested the following recommendations for food labelling in New Zealand.

5.1. Policy changes

Results from our literature review and public survey show that there is demand for more information on labels about a wide range of food attributes. Country of origin labelling is currently not mandatory in New Zealand whilst it is compulsory in Australia (5). Our survey of shoppers identified that 74% of consumers considered this information either very necessary or essential to have on food labels. Country of origin labelling provides consumers with information that is potentially relevant to both quality and “food miles” of food products. Consequently, we recommend labelling the country of origin as a mandatory requirement for all packaged foods for sale.

Based on our findings, the public supports the implementation of unhealthy food and drink taxes. Our survey asked participants about their agreement with the introduction of this tax with the example given to the participants being a sugar sweetened beverage tax. Results from our survey demonstrated that 63% of respondents somewhat agreed or strongly agreed that the government should introduce an unhealthy food and drink tax. Therefore we recommend that the government re-evaluate their position on taxation of unhealthy foods and drinks, for example sugar-sweetened beverages.

The Health Star Rating System has recently been implemented in New Zealand as a voluntary scheme to help consumers buy healthier options when shopping for food. (MPI - Health Star Rating page) The literature supports simple text and colourful symbols as a useful way to help reduce confusion around terminology on labels when trying to make healthy choices (36,37). However, we believe this should be a compulsory scheme for two reasons. Firstly, so consumers can compare different brands when making choices about the food they buy on the basis of the Health Star Rating. Secondly, mandatory labelling has been shown to provide strong motivation for producers to make improvements to the nutritional composition of their products, resulting in healthier options for consumers (81).

5.2. Simplification and standardisation of labels

Third party labelling, where an independent body certifies food products that meet certain criteria, is one strategy that can be used to convey information to consumers about aspects such as organic, free range and fair trade production. Third party labels are feasible and economically viable because producers contribute financially to have these labels on their products, provided that there is adequate consumer demand to ensure profitability. Our findings indicate that consumers would be receptive to more information about food production, but currently there is no standardisation or regulation of these types of labels, potentially resulting in consumer confusion as to the meaning of certain third party logos. Therefore we would recommend standardisation of third party labels. Perhaps FSANZ should expand their regulation of these additional dimensions in order to improve certification of these products. There is a potential for information overload so any changes in labels should be made in collaboration with consumers and graphic designers.

5.3. Adjunct information

We have identified that consumers find labels difficult to read and are dissuaded by confusing terminology. For example, additives listed in product ingredients are found to be too vague and overly scientific for the general population to interpret (72). One idea would be to produce 'quick response' (QR) codes on products that are linked to company websites with further information about ingredients as well as ethical and social considerations. This approach would allow accessibility to consumers as well as information provision not restricted by the limited packaging space on products. An example of this type of intervention is the 'Beyond the Label' initiative implemented by Nestlé for Kitkat® confectionery which now has smartphone-scannable barcodes allowing consumers to easily access information about nutrition and production (102). Inequity is an obvious factor to consider with this recommendation as the use of a QR code is limited to those with the appropriate technology, technological ability and motivation and thus may exclude or disadvantage some groups.

5.4. Recommendations for further research

Currently, there is a scarcity of literature that integrates the different dimensions (e.g. cost, font, colour) and examines their overall influence on consumer purchasing behaviour. We would recommend further research into this area as it would have both marketing and public health value in terms of meeting consumer needs. We also identified that a mismatch exists between what consumers report they would like to see on food labels and their actual purchasing behaviour when given a choice between two items. In addition, consumers have difficulty comprehending labels. We would recommend further research into the potential for collaboration between consumer, producer and regulator, with input from graphic designers, with the aim of producing criteria for labels that better serve each stakeholder group's interests and requirements.

Developing streamlined services that are personalised to individual consumers' attitudes towards nutritional, ethical, social and other considerations may be useful in addressing the complicated purchasing decisions faced by consumers. This could be in the form of a service that allows consumers to specify their preferences for certain aspects such as free range, organic, allergen-free and fair trade products, which are then matched through a large product database to grocery items that meet the individual's requirements. In saying this, there is a need for research into the public acceptance of these types of services and whether these will be successful in addressing the issue of food labelling and the complexity purchasing decisions.

5.5. Equity considerations

The consumer attention, comprehension and subsequent behavioural changes that labels attempt to achieve is known to differ across population groups in New Zealand (3). As stated above, Māori, Pacific and low-income consumers have been shown to be less likely to utilise and understand labels than other groups in New Zealand (3). Major reasons behind this inequity include factors such as insufficient time to read labels and lack of clarity of information, but are also likely to include complex and deep-rooted beliefs as to cultural relevance of food labels (3). When introducing an intervention such as amendments to

current labelling regulations, these inequities must be considered. Ensuring simplicity of labels and use of graphics and colour may be a suitable strategy to narrow inequity between population groups, and reflects suggestions made by Māori, Tongan, Samoan and low-income focus groups consulted on labelling issues (3). Enhancing the cultural acceptance of labels may be another strategy. This could involve targeted use of Te Reo Māori for key words on labels. The use of graphics may also help to overcome the language barrier between culturally diverse population groups, especially when universally recognised graphics are used. Application of these strategies should be undertaken with the intention of reducing current inequities in label use and understanding, and should be supported by evidence of efficacy in disadvantaged groups as well as strengthened by active collaboration with consumers from target populations.

6. Conclusion

It is evident that there is significant demand from consumers for food labels with adequate information content. Nutritional and safety information is a priority for consumers but there is increasing demand for information about environmental, ethical and other concerns to appear on labels, as demonstrated by our survey findings. There is also evidence that disparities exist in understanding and use of labels between different groups and that standardisation and simplification of food labels could increase their use by consumers. Our key informant interviews found that while labels are an important vector for food information, several factors need to be improved to address underutilisation of labels by certain consumer groups. Improving label display and content, consumer education and use of complementary technologies may help to maximise the efficacy of labels as a mode of information transmission to consumers.

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Appendices

Appendix 1. Participant information sheet and consent form



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University of Otago, Wellington

Food Labelling

PARTICIPANT INFORMATION SHEET

Thank you for showing an interest in this project. It is entirely your choice whether or not to participate. This information sheet will help you decide if you'd like to take part. If you choose to take part, there is a consent form to fill out.

What is the aim of the project?

We are fourth year medical students, and are running a study on shopper's attitudes towards food labelling. We are particularly interested in your views on labelling of chicken products.

Who we are looking for?

Anyone age 16 years or over may participate. There are no direct benefits to taking part, however, the results from this study will be available by contacting the lead researcher.

What does the project involve?

Should you agree to take part in this project, you will be asked to participate in a street survey of approximately 5-10 minutes. We will record your answers on paper for later analysis. You may skip any questions you prefer not to answer, and may withdraw from this survey at any time without any disadvantage to yourself.

What happens to the information collected in the study?

We will be preparing a report and presentation at the conclusion of this project. Additionally, an article for publication may be written. You are welcome to request a copy of the results by contacting the lead researcher. All the data collected and reported will be anonymous. It will be stored securely for at least 5 years, and only be accessible by those involved in the project.

Who do I contact for more information, concerns, or a copy of the results?

Professor Michael Baker

Department of Public Health
University of Otago, Wellington
04 918 6802
michael.baker@otago.ac.nz

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph +643 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.



MEDICAL STUDENT RESEARCH

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CONSENT FORM

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:

1. My participation in the project is entirely voluntary;
2. I am free to withdraw from the project at any time without any disadvantage;
3. The results of the project may be reported and published, but nothing that could personally identify me will be used
4. Data collected will be securely stored for at least 5 years

I agree to take part in this project.

.....
(Participant's Signature)

.....
(Date)

.....
(Printed Name)

Appendix 2. Survey form



MEDICAL STUDENT RESEARCH

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Food Labelling

SURVEY FORM

A. Interview details

Informed consent gained: Yes ☐

1. Interviewer _____
2. Location _____
3. Date _____ Time _____
4. Are you the main shopper for your household? Yes ☐ No ☐

B. Categories of information on food labels

Read: Food labels can have a variety of information displayed on them. Please look at this show card and tell me how necessary you think it is that labels have the following information:

[SHOWCARD 1](Necessary statements. NB. if necessary remind them that we are referring to label information)

5. Food safety to protect from infectious diseases, e.g. proper handling and storage
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
6. Safety for vulnerable groups, e.g. people with nut allergies
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
7. Nutritional composition, e.g. percentage of sugar, salt and saturated fat
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
8. Energy in food, e.g. distance needed to walk to 'burn off' calories per serving
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
9. Additives, e.g. preservatives, colouring agents
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
10. Environmental impact and sustainability, e.g. greenhouse gas (carbon) footprint
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
11. Animal welfare, e.g. free range
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
12. Welfare of workers involved in production, e.g. fair trade
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
13. Information for those with specific dietary preferences & religious beliefs, e.g. vegetarian, halal
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
14. Value for money, e.g. cost per 100g or cost per kg
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

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15. Country of origin labelling to help consider food safety risks and other concerns eg, animal welfare, welfare of workers

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

C. General views on food labels

Read: I'd now like to ask you about your general view on food labels. Please look at this show card and indicate your level of agreement with the following statements:

[SHOWCARD 2](Agreement statements)

16. Excluding the price label, I always read food labels before buying a food product for the first time

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

17. I believe food labels currently contain all the information I need

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

18. I believe the government should prohibit certain foods from being in the market if they are, for example, unhealthy for people or bad for the environment

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

19. I believe the government should tax unhealthy foods and drinks, e.g. sugar sweetened beverages

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

20. I believe consumers should be given all the information about foods so that they can decide themselves, e.g. each product has a link to a website with this information

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D. Knowledge of fresh chicken

Read: We now have some more specific questions to ask you about one type of food, chicken.

21. Do you buy, prepare or cook chicken? Yes ☐ No ☐

22. If yes, which of the following chicken products do you buy, prepare or cook?

| | | |
|---|------------------------------|-----------------------------|
| a. Fresh raw chicken | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| b. Frozen raw chicken | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| c. Cooked chicken | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| d. Other chicken products (specify) _____ | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

23. How often do you typically prepare fresh raw chicken at home?

| | |
|-----------------------------|--------------------------|
| a. Daily | <input type="checkbox"/> |
| b. 2-4 times per week | <input type="checkbox"/> |
| c. Once per week | <input type="checkbox"/> |
| d. 1 to 3 times per month | <input type="checkbox"/> |
| e. Less than once per month | <input type="checkbox"/> |
| f. Never | <input type="checkbox"/> |

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24. Did you know that fresh raw chicken can carry bacteria (bugs) that can make you sick?

Yes ☐ No ☐

a. If yes, can you tell me the name of the bacteria (bug)?

Specify: _____

b. If no, or named different bacteria, have you heard about c.....r?

Yes ☐ No ☐

25. How much of the fresh raw chicken for sale in New Zealand do you believe has c.....r on it? (NB. Best guess)

a. Little or none (<10%) ☐

b. Some (10-40%) ☐

c. About half (40-60%) ☐

d. Most (60-90%) ☐

e. Almost all or all (>90%) ☐

26. For the following statements about safe chicken preparation please tell me which ones you think are true or false, or are ones you 'don't know'?

a. You should use a separate knife and chopping board for fresh raw chicken from other ingredients

T ☐ F ☐ Don't know ☐

b. Hot tap water is sufficient to clean anything that comes into contact with fresh raw chicken

T ☐ F ☐ Don't know ☐

c. Fresh raw chicken must be cooked through before eating

T ☐ F ☐ Don't know ☐

d. Rinsing fresh raw chicken under the tap will reduce your likelihood of getting sick from it

T ☐ F ☐ Don't know ☐

e. You should clean and disinfect your kitchen bench after contact with fresh raw chicken

T ☐ F ☐ Don't know ☐

f. Frozen raw chicken has less campylobacter than fresh raw chicken

T ☐ F ☐ Don't know ☐

E. Views on content of labelling of fresh chicken

Read: I now want to ask you about your views on labelling of fresh chicken. Just to let you know, most fresh raw chicken products sold in New Zealand are contaminated with campylobacter. Please look at this show card and tell me how necessary you think it is that labels on fresh chicken have the following information features:

[SHOWCARD 1](Necessary statements. NB. If asked, "most" is 60-90%)

27. The level of campylobacter on that particular product

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

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28. Features of campylobacter infection and its complications

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

29. Correct cooking to kill campylobacter

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

30. Correct handling and storage to prevent campylobacter cross-contamination of other foods

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

31. Correct cleaning to kill campylobacter on benches and other surfaces

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

32. Large, brightly coloured warning labels on chicken products to explain the risk of campylobacter

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

F. Fresh chicken label mock-ups

Read: We have a current typical label and prepared sample mock-ups of possible fresh raw chicken labels to show you. Please look at this show card and tell me which you think is most effective at communicating safe chicken preparation information to you:

[SHOWCARD 3](Mock-ups. NB. Read out options on showcard)

A. Current label ☐

B. Current with extra information ☐

C. Separate 'pronounced' label ☐

G. Participant details

Read: We just need a few details about you:

33. Age group: 16-19 20-29 30-39 40-49 50-59 60-69 70-79 80+

34. Sex: M ☐ F ☐

35. Which suburb do you live in?: _____

36. Which ethnic group do you belong to? Indicate the group or groups which apply to you
[SHOWCARD 4](Ethnicity. NB. Multiple responses are possible)

- | | |
|--|----------------------|
| a. New Zealand European | b. Māori |
| c. Samoan | d. Cook Island Māori |
| e. Tongan | f. Niuean |
| g. Chinese | h. Indian |
| i. Other such as DUTCH, JAPANESE, TOKELAUAN. Please state: _____ | |
| j. Don't know | k. Refused |

Read: That is the end of the survey. Do you have any comments or questions?

Notes: _____

Survey Ends

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Appendix 3. Survey showcards

SHOWCARD 1

Please indicate how necessary you think it is that labels have such information

| | | | | | |
|---|-------------|--------------------|----------------------|----------------|-------------|
| 1 | 2 | 3 | 4 | 5 | |
| ← | Unnecessary | Somewhat necessary | Moderately necessary | Very necessary | Essential → |

SHOWCARD 2

Please indicate your level of agreement to the following statements on this scale

| | | | | | |
|---|-------------------|-------------------|----------------------------|----------------|------------------|
| 1 | 2 | 3 | 4 | 5 | |
| ← | Strongly disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Strongly Agree → |

SHOWCARD 3

Please tell us which you think is most effective at communicating safe chicken preparation information to you

A



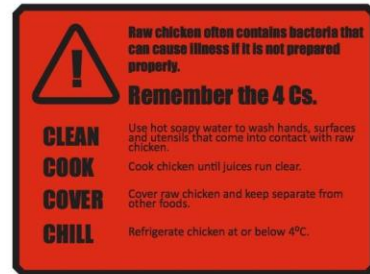
- Current label

B



- Current label with information larger

C



- Information on a separate label

SHOWCARD 4

Which ethnic group do you belong to? Indicate the group or groups which apply to you.

- | | |
|---|----------------------|
| a. New Zealand European | b. Māori |
| c. Samoan | d. Cook Island Māori |
| e. Tongan | f. Niuean |
| g. Chinese | h. Indian |
| i. Other such as DUTCH, JAPANESE, TOKELAUAN. Please state | |

Appendix 4. Tables of survey data and results

Table 1. Categories of information on food levels

| Information Categories* | Frequency | | | | | Median(IQR**) | |
|---|---------------|------------------------|------------------------|----------------------|-------------|---------------|-------|
| | Unnecessary-1 | Somewhat Unnecessary-2 | Moderately Necessary-3 | Somewhat Necessary-4 | Essential-5 | | |
| Vulnerable Groups | 4 | 1 | 16 | 70 | 310 | 5(5-5) | N=401 |
| Food safety | 5 | 10 | 36 | 83 | 267 | 5(4-5) | N=401 |
| Nutrition | 3 | 9 | 46 | 127 | 215 | 5(4-5) | N=400 |
| dietary/religious preferences | 14 | 30 | 51 | 110 | 195 | 4(4-5) | N=400 |
| Additives | 3 | 18 | 66 | 117 | 195 | 4(4-5) | N=399 |
| Animal welfare | 6 | 15 | 74 | 111 | 193 | 4(4-5) | N=399 |
| Country of origin | 9 | 19 | 77 | 111 | 183 | 4(3-5) | N=399 |
| Workers' welfare | 11 | 18 | 76 | 113 | 182 | 4(3-5) | N=400 |
| Value for Money | 20 | 39 | 98 | 101 | 142 | 4(3-5) | N=400 |
| Environmental impact and sustainability | 15 | 40 | 103 | 127 | 115 | 4(3-5) | N=400 |
| Energy | 21 | 59 | 133 | 94 | 90 | 3(3-4) | N=397 |

*Categories from section B of survey

**IQR=Interquartile Range

Table 2. Categories of information on food levels for each deprivation level

| Information Categories** | Median response for Deprivation* (IQR***) | | | | | | | | | | Spearman's ρ (p-value) |
|---|---|--------|----------|----------|-----------|--------|--------|-----------|----------|----------|-----------------------------------|
| | Dep 1 | Dep 2 | Dep 3 | Dep 4 | Dep 5 | Dep 6 | Dep 7 | Dep 8 | Dep 9 | Dep 10 | |
| Vulnerable Groups | 5(4-5) | 5(5-5) | 5(5-5) | 5(5-5) | 5(5-5) | 5(5-5) | 5(4-5) | 5(5-5) | 5(4-5) | 5(5-5) | -0.054(0.294) |
| Food safety | 4(4-5) | 5(4-5) | 5(5-5) | 5(5-5) | 5(4.25-5) | 5(5-5) | 4(3-5) | 5(4-5) | 5(4-5) | 5(4.5-5) | 0.72(0.158) |
| Nutrition | 4(4-5) | 5(4-5) | 5(4-5) | 5(4-5) | 4(4-5) | 4(4-5) | 4(4-4) | 5(4-5) | 4(4-5) | 5(4-5) | -0.025(0.628) |
| Dietary/religious preferences | 4(3-5) | 4(3-5) | 5(4-5) | 4(4-5) | 5(3-5) | 4(4-5) | 4(2-5) | 5(4-5) | 4(3-5) | 4(4-5) | 0.001(0.984) |
| Additives | 4(4-5) | 4(4-5) | 5(4-5) | 4(4-5) | 4(4-5) | 4(4-5) | 3(3-5) | 5(4-5) | 4(3-4) | 4(3-5) | -0.036(0.48) |
| Animal welfare | 4(4-5) | 5(4-5) | 5(4-5) | 4(3.5-5) | 4(4-5) | 4(4-5) | 3(3-4) | 5(4-5) | 4(3-5) | 5(3-5) | 0.006(0.911) |
| Country of origin | 4(3-5) | 4(3-5) | 5(4-5) | 5(4-5) | 4(3.25-5) | 5(4-5) | 4(3-5) | 4(4-5) | 4(3-5) | 5(3-5) | 0.021(0.676) |
| Workers' welfare | 4(4-5) | 5(4-5) | 4(3-5) | 5(3-5) | 4(3-5) | 4(3-5) | 3(3-4) | 4(4-5) | 4(2.5-5) | 4(4-5) | -0.058(0.26) |
| Value for Money | 4(3-4) | 4(3-5) | 4(3-5) | 3(3-4) | 4(2-5) | 4(3-5) | 3(3-4) | 4(3-5) | 4(3-5) | 4(3-5) | 0.043(0.401) |
| Environmental impact and sustainability | 4(3-4) | 4(3-5) | 4(3-5) | 4(3-4) | 4(3-4) | 4(3-5) | 3(3-3) | 4(3-5) | 3(3-4.5) | 4(3-5) | 0.036(0.478) |
| Energy | 3.5(3-4) | 3(3-4) | 3.5(3-5) | 3(3-4.5) | 3(3-4) | 3(3-5) | 3(2-4) | 4(3-4.75) | 3(2-4.5) | 4(2.5-4) | 0.26(0.606) |

*Deprivation based on suburb

**Categories from section B of survey

***IQR=Interquartile Range

Table 3. Categories of information on food levels for each ethnicity

| Median response by Ethnicity* (IQR***) | | | | | | | | | | | | |
|---|-----------|-----------|----------------------|--------------|-------------|----------------------|-----------|-----------|----------------------|---------------------|------------|----------|
| Information Categories** | Māori | Non-Māori | Mann-Whitney p-value | Pacific | Non-Pacific | Mann-Whitney p-value | Asian | Non-Asian | Mann-Whitney p-value | NZ European & Other | Don't Know | Refused |
| | N=36 | N=360 | | N=26 | N=370 | | N=32 | N=364 | | N=302 | N=5 | N=2 |
| Vulnerable Groups | 5(4-5) | 5(5-5) | 0.192 | 5(5-5) | 5(5-5) | 0.691 | 5(4.75-5) | 5(5-5) | 0.66 | 5(5-5) | 4(3-5) | 4.5(4-5) |
| Food safety | 5(4-5) | 5(4-5) | 0.213 | 5(4-5) | 5(4-5) | 0.555 | 5(4-5) | 5(4-5) | 0.485 | 5(4-5) | 5(4-5) | 4(4-4) |
| Nutrition | 5(4-5) | 5(4-5) | 0.773 | 5(4-5) | 5(4-5) | 0.341 | 4.5(4-5) | 5(4-5) | 0.621 | 5(4-5) | 3(3-5) | 3(2-4) |
| dietary/religious preferences | 4(3-5) | 4.5(4-5) | 0.172 | 4.5(4-5) | 4(4-5) | 0.478 | 5(4-5) | 4(4-5) | 0.021 [‡] | 4(4-5) | 3(3-4) | 4(3-5) |
| Additives | 4(3-5) | 4(4-5) | 0.127 | 4(3.25-4.75) | 5(4-5) | 0.061 | 5(4-5) | 4(4-5) | 0.22 | 5(4-5) | 5(3-5) | 4(3-5) |
| Animal welfare | 4(3-5) | 4(4-5) | 0.603 | 4(4-5) | 4(4-5) | 0.979 | 4(3-5) | 4(4-5) | 0.073 | 4(4-5) | 4(3-5) | 4.5(4-5) |
| Country of origin | 4(3.75-5) | 4(3-5) | 0.74 | 5(4-5) | 4(3-5) | 0.471 | 4(4-5) | 4(3-5) | 0.747 | 4(3-5) | 4(4-5) | 5(5-5) |
| Workers' welfare | 4(3-5) | 4(4-5) | 0.13 | 4(4-5) | 4(3-5) | 0.64 | 4(3-5) | 4(3-5) | 0.42 | 4(4-5) | 5(4-5) | 4(4-4) |
| Value for Money | 4(3-5) | 4(3-5) | 0.107 | 4(3-5) | 4(3-5) | 0.473 | 4.5(3-5) | 4(3-5) | 0.169 | 4(3-5) | 4(4-5) | 3.5(2-5) |
| Environmental impact and sustainability | 3(3-4) | 4(3-5) | 0.011 [‡] | 4(3.25-5) | 4(3-5) | 0.293 | 4(3-5) | 4(3-5) | 0.592 | 4(3-5) | 4(4-4) | 2.5(2-3) |
| Energy | 3(3-5) | 4(4-5) | 0.592 | 4(3-5) | 3(3-4) | 0.012 [‡] | 4(3-5) | 3(3-4) | 0.131 | 3(3-5) | 4(3-5) | 2(1-3) |

*Based off NZ Census

**Categories from section B of survey

***IQR=Interquartile Range, Min-Max displayed for Refused

NB. Unnecessary-1, Somewhat Unnecessary-2, Moderately Necessary-3, Somewhat Necessary-4, Essential-5

[‡]-significant at the 0.05 level

Table 4. General views on food labels

| Agreement with statement* | Frequency | | | | | | Median(IQR**) | |
|---------------------------|---------------------|---------------------|------------------------------|------------------|------------------|--|---------------|-------|
| | Strongly Disagree-1 | Somewhat Disagree-2 | Neither Agree nor Disagree-3 | Somewhat Agree-4 | Strongly Agree-5 | | | |
| Consumer decider | 6 | 10 | 35 | 95 | 253 | | 5(4-5) | N=399 |
| Taxing unhealthy foods | 40 | 41 | 67 | 100 | 150 | | 4(3-5) | N=398 |
| Consumer Reads Label | 11 | 52 | 49 | 154 | 134 | | 4(3-5) | N=400 |
| Government prohibition | 35 | 65 | 87 | 99 | 113 | | 4(2.5-5) | N=399 |
| Labels contain all Info | 55 | 126 | 84 | 103 | 31 | | 3(2-4) | N=399 |

*Categories from section C of survey

**IQR=Interquartile Range

Table 5. General views on food labels for each Deprivation level

| | | Median response for Deprivation* (IQR***) | | | | | | | | | | Spearman's ρ |
|---------------------------|-------------------------|---|-----------|--------|----------|--------|--------|--------|--------|----------|----------|---------------------------|
| | | Dep 1 | Dep 2 | Dep 3 | Dep 4 | Dep 5 | Dep 6 | Dep 7 | Dep 8 | Dep 9 | Dep 10 | (p-value) |
| Agreement with statement* | | | | | | | | | | | | |
| | Consumer decider | 5(4-5) | 5(4-5) | 5(4-5) | 4(4-5) | 5(4-5) | 5(5-5) | 4(4-5) | 5(4-5) | 5(4-5) | 5(4-5) | 0.013(0.805) |
| | Taxing unhealthy foods | 4(3-5) | 4(3-5) | 4(3-5) | 4(3-5) | 4(2-5) | 4(3-5) | 4(3-4) | 5(3-5) | 4(2-5) | 4(2.5-5) | 0.052(0.309) |
| | Consumer Reads Label | 4(3-5) | 4(3.75-5) | 4(3-5) | 4(4-5) | 4(3-4) | 4(4-5) | 4(2-4) | 4(4-4) | 3(2-5) | 4(3.5-5) | -0.085(0.097) |
| | Government prohibition | 3(2-4) | 4(2-4) | 4(3-5) | 3(2.5-5) | 3(2-4) | 4(3-5) | 3(3-4) | 4(3-5) | 3(2-4.5) | 4(3-5) | 0.107(0.036) [‡] |
| | Labels contain all Info | 2(2-4) | 2.5(2-4) | 3(2-4) | 3(2-4) | 3(2-4) | 3(2-4) | 3(3-4) | 2(2-3) | 3(2-5) | 3(2-4) | 0.068(0.183) |

*Categories from section C of survey

**IQR=Interquartile Range

Spearman's ρ is for deprivation

[‡]-significant at the 0.05 level (2-tailed)

Table 6. General views on food labels for each Ethnicity

| Median response by Ethnicity* (IQR**) | | | | | | | | | | | | |
|---------------------------------------|-----------|-----------|----------------------|-----------|-------------|----------------------|--------|-----------|----------------------|---------------------|------------|----------|
| Agreement with statement* | Māori | Non-Māori | Mann-Whitney p-value | Pacific | Non-Pacific | Mann-Whitney p-value | Asian | Non-Asian | Mann-Whitney p-value | NZ European & Other | Don't Know | Refused |
| | N=36 | N=360 | | N=26 | N=370 | | N=32 | N=364 | | N=302 | N=5 | N=2 |
| Consumer decider | 5(4-5) | 5(4-5) | 0.204 | 5(5-5) | 5(4-5) | 0.187 | 5(4-5) | 5(4-5) | 0.398 | 5(4-5) | 5(4-5) | 5(5-5) |
| Taxing unhealthy foods | 4(1.75-5) | 4(3-5) | 0.1 | 4(3-5) | 4(3-4) | 0.959 | 5(3-5) | 4(3-5) | 0.272 | 4(3-5) | 4(3-5) | 4.5(4-5) |
| Consumer Reads Label | 4(3-5) | 4(3-5) | 0.293 | 4(3.25-5) | 4(3-5) | 0.931 | 4(4-5) | 4(3-5) | 0.085 | 4(3-5) | 4(4-4) | 4.5(4-5) |
| Government prohibition | 4(2-5) | 4(3-5) | 0.973 | 4(3-4) | 4(2-5) | 0.809 | 4(3-5) | 4(2-5) | 0.012 [‡] | 4(2-5) | 4(2-5) | 3(2-4) |
| Labels contain all Info | 3(3-4) | 3(2-4) | 0.02 [‡] | 3(2-4) | 3(2-4) | 0.462 | 4(2-4) | 3(2-4) | 0.036 [‡] | 2(2-4) | 2(2-2) | 1(1-1) |

*Categories from section C of survey

**IQR=Interquartile Range, Min-Max for Refused

Spearman's ρ is for deprivation

[‡]-significant at the 0.05 level